Loss / Near Loss (L/NL)

Loss/Near Loss ID : 23624 **Status :** Closed

Short Description : Natural gas routed to T-397

Responsible Organization : MFG|RIC|Ops|B&S/U&E ABU|B&S|A Crew(RICREF)

Loss Type : Loss

Actual Severity Classification (Loss Only) : Level 2 **Potential Severity Classification :** Level 3b

Location of Loss/Near Loss : Rich|B&S | T&B | Pole Yard Tank Field

Date/Time Occurred : 10/10/2011 3:00:00 PM

Date/Time Reported : 10/10/2011 3:05:00 PM

Process Safety Related Event : No

Type of Activity : Other

Loss/Near Loss Description : INITIAL DESCRIPTION: At 3:00 PM the operator was making rounds when he spotted the pressure valves on the tank roof burping liquid on the roof.

TAPROOT DESCRIPTION: Natural gas was inadvertently routed to T-397 on October 8, 2011 at 16h37 when flow reversed from the headspace of V-153A/B at the SDA. This resulted in a hazardous condition as natural gas vented via the two breather valves and pressure relief door on the roof of T-397. Attempts to mitigate the risks included cordoning off the tank and introducing a nitrogen purge to the head space. Efforts to locate the source of the natural gas was complicated by startup activity on the TKC and shutdown activity on RLOP and the SDA. The source of the natural gas was identified and isolated on October 13, 08h04. The consequence of this incident was a Title V deviation for exceeding the vapor pressure limit of 0.5 psia for a tank in unregulated service BAAQMD Reg 8-5-117 and Permit Condition 20764. The refinery also received two odor complaints from the community. It was determined that the event met the requirements of a Tier I Loss of Containment (LOC) incident.

LPS Alert or Bulletin : No Alert/Bulletin Needed

Immediate Corrective Action Taken : First he confirmed the tank's liquid level, then he called the units in an attempt to find out what happened. When all was noted, he informed them he would be closing all non-essential valves.

Injury not OSHA-reportable to the Responsible Organization's Site : No

Address 1 :

Address 2 :

Address 3 :

City :

Country :

State/Province :

Zip/Postal Code :

Date Entered : 10/11/2011 7:16:50 AM

Entered By : TAYLOR, HERBERT (HETA)

Required for Transportation (MVC) Losses

Weather : Calm

Temperature : 32 to <80 F (0 to <27 C)

Lighting : Day

Loss / Near Loss (L/NL)

Loss Subtypes

Loss

Environmental

Loss of Containment

Regulatory Compliance

Responsibilities

Supervisor/Lead Responsible : CHAVDA, BHARAT - CBHA

Management Sponsor : MAUER, JON - JMAU

Injury/Illness Coordinator :

Reported By : TAYLOR, HERBERT - HETA

Attachments / Links

Module	ID	Type	File Name / Link	Comment/Description	Upload Date
Investigation	14594	LINK	https://collab001-hou.sp.chevron.net/sites/dsgmfgoe/LPSOut/RlDocLib/Loss%2023624%20Gas%20to%20T397-Oct2011%20final%20report_5.docx	TapRooT summary	11/14/2011 2:29:53 PM
Investigation	14594	LINK	https://collab001-hou.sp.chevron.net/sites/dsgmfgoe/LPSOut/RlDocLib/Loss%2023624%20Gas%20to%20T397_Timeline_4.vsd	TapRooT timeline	11/14/2011 2:32:26 PM

Consequences

ID	Type	Party Involved	Status
828	Environmental	CHAVDA, BHARAT (CBHA)	Closed
3236	Regulatory Compliance		
3998	Z For Metrics Only - Do Not Use		

Consequence - Environmental

Environmental ID : **828**

Status : Closed

Discovery Date/Time : 10/13/2011 8:22:00 AM

Ownership : Chevron

Reported By : CHAVDA, BHARAT (CBHA)

Environmental Loss Types : IRHV

Shelter in Place : No

Loss / Near Loss (L/NL)

Wind Speed :

Wind Direction :

Number of Complaints :

Number of Third Parties Hospitalized from Release :

Number of Third Party Fatalities from Release :

Equipment from which the release originated :

If other Equipment, specify :

Quantity

Material Spilled or Released	Released to	Unit of Measure	Release Amount	Recovered Amount	Hazardous Property
Natural Gas	Release to Air	LB	896,400.00	0.00	Flammable Gas / Vapor

Agency Notification

Reported By	Agency Notified	Contact Name/Phone Number	Notify Date	Comments/Report Number
QUIROZ, RICHARD (RJQU)	State/Province - Environmental	xxxx	10/12/2011 12:00:00 AM	

Financial Costs

Date	Cost Type	Cost Category	Cost (USD)	Net Cost	Ownership Percentage	Details
11/14/2011 12:00:00 AM	Estimated/Planned	Expense Impact	97,000.00	97,000.00	100	$4.85/MMbtu 20.6MMSCF

Consequence - Z For Metrics Only – Do Not Use

Loss of Containment (PSE) ID : 3998

PSE Tier Category : Tier 1

Location Function : Refining

Process System Identifier : Refining: tank farm/offsites

Mode of Operation : Normal

Location Detail : ~8300 lbs/hour of natural gas was released to atmosphere from Tank T-397 exceeding the threshold category of 1100 lbs/hour.

Point of Release : Atmospheric tank

Maximum Release Rate per Hour : 3772

Maximum Release Rate UOM : Kilograms

PSE Community Response : Not Applicable

PSE Related Injury/Illness : Not Applicable

Loss / Near Loss (L/NL)

LOPC Type of Material : Flammable

LOPC Location : Outdoor Release

LOPC Material Threshold Category : T1: Threshold Release Category 5

PSE Related Property Damages : Not Applicable

Release from Pressure Relief Device (PRD) : Not Applicable

PRD Release :

If PRD Release, Specify Material Threshold Category :

Consequence - Regulatory Compliance

Regulatory Compliance ID : **3236**

Subtypes : NOV - Air

Description : The consequence of this incident was a Title V deviation for exceeding the vapor pressure limit of 0.5 psia for a tank in unregulated service BAAQMD Reg 8-5-117 and Permit Condition 20764.

Compliance Type :

Compliance Category :

Journal (Loss/Near Loss)

Personnel	Date	Journal Note	Type
GUTIERREZ, DARREL (DGFH)	1/27/2012 12:00:00 AM	Added New LOC Consequence	Sys Admin Comments
GUTIERREZ, DARREL (DGFH)	12/6/2011 12:00:00 AM	Total Quantity Released: 20,600,000 SCF @ 4,570,000 /day for ~4.5 days. Converted it to Lbs for Reporting correct release amount	Sys Admin Comments
MAUER, JON (JMAU)	11/10/2011 3:42:01 PM	Recycled to make several adjutments to the Loss and Investigation reports.	Workflow Enforced
RUYLE, MARY ANNE (MRUY)	11/8/2011 12:00:00 AM	Changed from Management Review to Fact Gathering to allow supervisor responsible to make edits to the description.	Workflow Enforced

Investigation

Investigation ID : **14594**

Status : Closed

Investigation Date : 10/21/2011 12:00:00 AM

Type : TapRoot

Sensitive/Commercial : No

Responsibilities

Investigation Team Lead : CHAVDA, BHARAT - CBHA

Loss / Near Loss (L/NL)

Primary Contact : CHAVDA, BHARAT - CBHA

Management Sponsor : MAUER, JON - JMAU

Reviewer(s) : PAK, JOHNNY - JPAK

Investigation Team Member(s) : JONES, KENNETH - JKEC
MILLER, MARSHALL - MMMG
WOHLGESCHAFFEN, KEN - KRWO

Taproot™ Facilitator : CHAVDA, BHARAT - CBHA

OE Tenets & Processes	
OE Tenets Violated	**Note**
01-Operate within design and environmental limits	
02-Operate in a safe and controlled condition	
04-Follow safe work practices and procedures	
07-Comply with all applicable rules/regulations	
OE Processes Implicated *	**Note**
Not in List/None	#1 : Safe Operations #7 : Environmental Stewardship

Journal (Investigation)

Created By	Date	Journal Note	Journal Type
PAK, JOHNNY (JPAK)	11/11/2011 11:17:11 AM	Recycled due to additional changes needed.	Workflow Enforced
CHAVDA, BHARAT (CBHA)	11/11/2011 12:00:00 AM	It was determined that the event met the requirements of a tier 1 loss of containment incident.	Workflow Enforced
CHAVDA, BHARAT (CBHA)	11/9/2011 12:00:00 AM	The detailed Taproot report for this incident is located in the folder \\RIC841NTSHARE1.RIC841 .CHEVRONTEXACO.NET\SHARE\Refinery-Wide\LPS_Investigations\Attorney-Client_Privileged_Investigations	Workflow Enforced
CHAVDA, BHARAT (CBHA)	11/8/2011 12:00:00 AM	Natural gas was inadvertently routed to T-397 on October 8, 2011 at 16h37 when flow reversed from the headspace of V-153A/B at the SDA. This resulted in a hazardous condition as natural gas vented via the two breather valves and pressure relief door on the roof of T-397. Attempts to mitigate the risks included cordoning off the tank and introducing a nitrogen purge to the head space. Efforts to locate the source of the natural gas was complicated by startup activity on the TKC and shutdown activity on RLOP and the SDA. The source of the natural gas was identified and isolated on October 13, 08h04. The consequence of this incident was a Title V deviation for exceeding the vapor pressure limit of 0.5 psia for a tank in unregulated service BAAQMD Reg 8-5-117 and Permit Condition 20764. The refinery also received two odor complaints from the community.	Workflow Enforced

Loss / Near Loss (L/NL)

Root Cause

Root Cause	Factors	Solution / Action Item Id	Solution / Action Item Status	Solution / Action Item Due Date
Practice / repetition NI	A. Lack of skill or knowledge: 2-Person was trained, but did not fully understand skill or knowledge. (Instruction needs improvement, practice or repetition needed, testing, etc)	98156	Closed	1/31/2012 12:00:00 AM
No procedure	E. Lack of or inadequate procedures: 4-Procedure/acceptable practice exists and technically right, but needs to be improved (improve clarity, cover additional scenario/steps, etc)	98523	Closed	1/31/2012 12:00:00 AM
Practice / repetition NI	A. Lack of skill or knowledge: 2-Person was trained, but did not fully understand skill or knowledge. (Instruction needs improvement, practice or repetition needed, testing, etc)	98544	Closed	12/31/2011 12:00:00 AM
Equipment Environment not considered	G. Inadequate tools or equipment: 8-System or Equipment is designed in such a way that errors are undetectable or unable to be detected before a failure/incident occurs	98545	Closed	4/30/2012 12:00:00 AM
Additional consideration	G. Inadequate tools or equipment: 1-Tools / instruments need improvement (no homemade tools used, tool is not fully functioning, etc).	99678	Closed	3/7/2012 12:00:00 AM
Additional consideration	C. Doing the job according to procedures or acceptable practices takes more time/effort: 2-Person chooses to not follow procedure or accepted practice and does not hold themselves accountable for following	99680	Closed	1/31/2012 12:00:00 AM
Additional consideration	B. In past, did not follow procedures or acceptable practices and no incident occurred: 1-Person chooses to not follow procedure or accepted practice because history of not following has not resulted in bad consequence	99700	Closed	12/31/2011 12:00:00 AM
Knowledge NI	A. Lack of skill or knowledge: 2-Person was trained, but did not fully understand skill or knowledge. (Instruction needs improvement, practice or repetition needed, testing, etc)	99703	Closed	1/31/2012 12:00:00 AM
		99705	Closed	1/31/2012 12:00:00 AM

Solution/Action Item

Solution/Action Item ID : 98156

Status : Closed

Loss / Near Loss (L/NL)

Source : Investigation

Source ID : 14594

Responsible Organization : MFG|RIC|Ops|B&S/U&E ABU|B&S|A Crew(RICREF)

Sensitive/Commercial : No

Root Cause : Practice / repetition NI

Factor : A. Lack of skill or knowledge : 2-Person was trained, but did not fully understand skill or knowledge. (Instruction needs improvement, practice or repetition needed, testing, etc)

Solution Type (user entered) : LPS: Personal

Solution : Review this incident with the crews. Highlight the need to be aware of the potential for reverse flow when decommissioning equipment.

Date Assigned : 11/7/2011 12:00:00 AM

Due Date : 1/31/2012 12:00:00 AM

Completion Date : 11/27/2011 12:00:00 AM

Action Taken : Crews are aware of this incident and the impact it had on Blending and Shipping.

V&V Date : 11/29/2011 12:00:00 AM

V&V Comments : STLs reviewed this incident with all 4 crews.

Person Responsible : WALKER, FREDRICK - FRCW

Supervisor/Lead Responsible : PAK, JOHNNY - JPAK

Journal (Action Item)

Created By	Date	Journal Note	Journal Type
Fong, Nancy (fonn)	11/9/2011 12:00:00 AM	Unchecked Sensitive/Commercial flag per request from Mary Anne Ruyle (Remedy INC000001981537)	Sys Admin Comments

Solution/Action Item

Solution/Action Item ID : **98523**

Status : Closed

Source : Investigation

Source ID : 14594

Responsible Organization : MFG|RIC|Ops|B&S/U&E ABU|B&S|A Crew(RICREF)

Sensitive/Commercial : No

Root Cause : No procedure

Factor : E. Lack of or inadequate procedures : 4-Procedure/acceptable practice exists and technically right, but needs to be improved (improve clarity, cover additional scenario/steps, etc)

Loss / Near Loss (L/NL)

Solution Type (user entered) : LPS: Organizational

Solution : Specify the operating mode of the P-155/A / V-153A/B system during an SDA shutdown in procedure SDAN3010 to avoid uncertainty and assist consistency. Include necessary cautionary notes with regards the potential for reverse flow to the LCO tank via FC-156 if P-155/A is shutdown.

Date Assigned : 11/8/2011 12:00:00 AM

Due Date : 1/31/2012 12:00:00 AM

Completion Date : 11/28/2011 12:00:00 AM

Action Taken : Updated shutdown procedure to isolate the hot dry LCO system to prevent backflow to tankage.

V&V Date : 11/28/2011 12:00:00 AM

V&V Comments : Verified SDA startup procedure has been updated as prescribed above (and per MOC 24185), and it has been updated on the EOM.

Person Responsible : JONES, KENNETH - JKEC

Supervisor/Lead Responsible : WALDROP, JASON - SWAL

Solution/Action Item

Solution/Action Item ID : **98544**

Status : Closed

Source : Investigation

Source ID : 14594

Responsible Organization : MFG|RIC|Ops|B&S/U&E ABU|B&S|A Crew(RICREF)

Sensitive/Commercial : No

Root Cause : Practice / repetition NI

Factor : A. Lack of skill or knowledge : 2-Person was trained, but did not fully understand skill or knowledge. (Instruction needs improvement, practice or repetition needed, testing, etc)

Solution Type (user entered) : LPS: Personal

Solution : Discuss the incongruities in the operation of the LCO system in the runup to the incident with the individual(s) concerned :
a. Operations of P-155/A with the spillback valve on manual and closed (14h42 on October 8),
b. Switching FC-156 to auto control shortly before shutting down P-155/A,
c. Switching LC-1532 to auto control as P-155/A is shutdown and operating LC-1531 on auto control during this time (14h41 on October 8).
Refer to Jason Waldrop if further information is required.

Date Assigned : 11/8/2011 12:00:00 AM

Due Date : 12/31/2011 12:00:00 AM

Completion Date : 11/15/2011 12:00:00 AM

Action Taken : Discussed the consequences of shutting these pumps down and having the CV placed in auto without isolating the pumps. As we saw in this event NG can get backed through the pumps and valves back to tankage

V&V Date : 11/27/2011 12:00:00 AM

V&V Comments : Completed

Person Responsible : HAGBERG, JASON - EHAG

Supervisor/Lead Responsible : WALKER, FREDRICK - FRCW

Solution/Action Item

Solution/Action Item ID : 98545

Status : Closed

Source : Investigation

Source ID : 14594

Responsible Organization : MFG|RIC|Ops|B&S/U&E ABU|B&S|A Crew(RICREF)

Sensitive/Commercial : No

Root Cause : Equipment Environment not considered

Factor : G. Inadequate tools or equipment : 8-System or Equipment is designed in such a way that errors are undetectable or unable to be detected before a failure/incident occurs

Solution Type (user entered) : LPS: Organizational

Solution : Perform a design review of the LCO supply system to the SDA in the context of the potential for reverse flow of natural gas to the LCO tank from V-153A/B and the potentially severe consequences. Determine if any engineering controls are required to mitigate a reverse flow of natural gas such as interlock of the valve (FC156) with the pump (P-155/A), high flow alarm on the natural gas, a design that eliminates the need for natural gas, etc.

Date Assigned : 11/8/2011 12:00:00 AM

Due Date : 4/30/2012 12:00:00 AM

Completion Date : 4/26/2012 12:00:00 AM

Action Taken : 2/13/12 update: Risk Assessment for NG backflow in cutter system was completed on 1/24/12 (attendees were Tim Storrs, Jason Waldrop, KC Jones, Eric Donnelly). Recommendation out of the risk assessment was to install a DCS interlock that chops the minimum flow control valve 67FC156 when running indications for both P-155 cutter pumps show "NOT RUNNING"
3/26/12 update: MOC 24579 in progress to implement DCS change
4/26/12 update: MOC 24579 completed through stage 2, change implemented

V&V Date : 4/30/2012 12:00:00 AM

V&V Comments : DCS interlock confirmed to be completed by Chuck Griffin. See email below:

From: Griffin, Chuck
Sent: Monday, April 30, 2012 7:39 AM
To: Pak, Johnny (JPAK); Boughner, Keith B. (bbou)
Subject: RE: OVERDUE SOLUTIONS - B&S

Johnny,

DCS interlock is done and in place. We used the flow meter rather than the motor run indications as this is 1) more standard, 2) more reliable, and 3) the motor run indications are not hard wired signals, which is something we always strive for in interlocks for reliability of the signals.

Chuck

Loss / Near Loss (L/NL)

Person Responsible : WALDROP, JASON - SWAL

Supervisor/Lead Responsible : PAK, JOHNNY - JPAK

Solution/Action Item

Solution/Action Item ID : **99678**

Status : Closed

Source : Investigation

Source ID : 14594

Responsible Organization : MFG|RIC|Ops|B&S/U&E ABU|B&S|A Crew(RICREF)

Sensitive/Commercial : No

Root Cause : Additional consideration

Factor : G. Inadequate tools or equipment : 1-Tools / instruments need improvement (no homemade tools used, tool is not fully functioning, etc).

Solution Type (user entered) : LPS: Organizational

Solution : Review the reasons for the nuisance alarms on FC-156 and, as appropriate, resolve so that the spillback control can be operated as designed.

Date Assigned : 11/14/2011 12:00:00 AM

Due Date : 3/7/2012 12:00:00 AM

Completion Date : 3/6/2012 12:00:00 AM

Action Taken : 2/9/12 update: MOC 24565 created to reduce high flowrate alarms on 67FC156 to only 1 audible alarm (existing two alarms not needed). MOC reviews in progress.

3/6/12: MOC 24565 completed and PVHI alarms changed (only 1 alarm now at 18 KBPD, removed the 20 KBPD alarm).

V&V Date : 3/12/2012 12:00:00 AM

V&V Comments : Complete

Person Responsible : WALDROP, JASON - SWAL

Supervisor/Lead Responsible : WALKER, FREDRICK - FRCW

Solution/Action Item

Solution/Action Item ID : **99680**

Status : Closed

Source : Investigation

Loss / Near Loss (L/NL)

Source ID : 14594

Responsible Organization : MFG|RIC|Ops|B&S/U&E ABU|B&S|A Crew(RICREF)

Sensitive/Commercial : No

Root Cause : Additional consideration

Factor : C. Doing the job according to procedures or acceptable practices takes more time/effort : 2-Person chooses to not follow procedure or accepted practice and does not hold themselves accountable for following

Solution Type (user entered) : LPS: Personal

Solution : Reinforce that signed off procedure needs to be submitted to the STL after use. Any comments or suggestions on the procedure needs to be marked up on this copy so that necessary improvement or clarifications can be made. Gain a commitment from those involved that this expectation will be met.

Date Assigned : 11/8/2011 12:00:00 AM

Due Date : 1/31/2012 12:00:00 AM

Completion Date : 12/27/2011 12:00:00 AM

Action Taken : Continous reinforcement to be cascaded through OD.

V&V Date : 12/27/2011 12:00:00 AM

V&V Comments : Also reinforced through crew discussions.

Person Responsible : WALKER, FREDRICK - FRCW

Supervisor/Lead Responsible : PAK, JOHNNY - JPAK

Solution/Action Item

Solution/Action Item ID : **99700**

Status : Closed

Source : Investigation

Source ID : 14594

Responsible Organization : MFG|RIC|Ops|B&S/U&E ABU|B&S|A Crew(RICREF)

Sensitive/Commercial : No

Root Cause : Additional consideration

Factor : B. In past, did not follow procedures or acceptable practices and no incident occurred : 1-Person chooses to not follow procedure or accepted practice because history of not following has not resulted in bad consequence

Solution Type (user entered) : LPS: Personal

Solution : Review with the crews that frequent and nuisance alarms, such as the FC-156 flow alarm, should be brought to the attention of the STL so that the appropriate cause can be investigated and corrective actions taken.

Date Assigned : 11/14/2011 12:00:00 AM

Due Date : 12/31/2011 12:00:00 AM

Completion Date : 11/15/2011 12:00:00 AM

Loss / Near Loss (L/NL)

Action Taken : Review with the crews that frequent and nuisance alarms, such as the FC-156 flow alarm, should be brought to the attention of the STL so that the appropriate cause can be investigated and corrective actions taken.

V&V Date : 11/20/2011 12:00:00 AM

V&V Comments : Crew discussion help per STL.

Person Responsible : HAGBERG, JASON - EHAG

Supervisor/Lead Responsible : PAK, JOHNNY - JPAK

Solution/Action Item

Solution/Action Item ID : **99703**

Status : Closed

Source : Investigation

Source ID : 14594

Responsible Organization : MFG|RIC|Ops|B&S/U&E ABU|B&S|A Crew(RICREF)

Sensitive/Commercial : No

Root Cause : Knowledge NI

Factor : A. Lack of skill or knowledge : 2-Person was trained, but did not fully understand skill or knowledge. (Instruction needs improvement, practice or repetition needed, testing, etc)

Solution Type (user entered) : LPS: Personal

Solution : Share the findings of this investigation with the team that performed the PHA review of the SDA in 2008 so that the learnings from this event are shared and to obtain a commitment from the team to perform a more thorough review in future

Date Assigned : 11/8/2011 12:00:00 AM

Due Date : 1/31/2012 12:00:00 AM

Completion Date : 1/31/2012 12:00:00 AM

Action Taken : An email communication was sent out on January 14, 2012 by Tim Storrs to members of the 2003 Project Team, members of the 2008 SDA PHA team, and current process and designs engineering managers sharing the learnings from this incident investigation. The following is an excerpt from this communication:

" A recent incident in the SDA plant (Incident Investigation LI 14594) involving natural gas flowing backward around the cutter charge pumps P-155/A through the pump minimum flow bypass control valve FV156 resulted in venting natural gas to atmosphere at the cutter(LCO) tank T-397. While this event occurred during a plant shutdown when cutter was being used intermittently for plant cleanup, it could also have occurred during normal operation if the main pump shut down and the spare was not started. Neither the PHA for the 2003 project to install the modified cutter delivery system nor the 2008 plant PHA mentions this potential backflow hazard scenario. When designing a new facility or performing a risk assessment on an existing plant, it is important to remember the potential for backflow from a secondary source if the main pressurization is lost."

In addition to this communication, a new electronic folder has been created to aid PHA facilitators incorporate learnings from this incident and from future incidents in which the PHA did not adequately recognize risks. This folder can be located at O:\Psm\Mod-only\PHAfiles\PHA Learnings.

V&V Date : 2/4/2012 12:00:00 AM

V&V Comments : Current PHA team has added this lesson learned into all PHA's and shared with all team members of the 2008 team.

Loss / Near Loss (L/NL)

Person Responsible : CROW, MARK - MXEW

Supervisor/Lead Responsible : WILDMAN, STEPHEN - STDW

Solution/Action Item

Solution/Action Item ID : 99705

Status : Closed

Source : Investigation

Source ID : 14594

Responsible Organization : MFG|RIC|Ops|B&S/U&E ABU|B&S|A Crew(RICREF)

Sensitive/Commercial : No

Root Cause : Knowledge NI

Factor : A. Lack of skill or knowledge : 2-Person was trained, but did not fully understand skill or knowledge. (Instruction needs improvement, practice or repetition needed, testing, etc)

Solution Type (user entered) : LPS: Personal

Solution : Share the findings of this investigation with the team that performed the HAZOP for the LCO facility in ~2003 so that the learnings from this event are shared and to obtain a commitment from the team to perform a more thorough review in future.

Date Assigned : 11/8/2011 12:00:00 AM

Due Date : 1/31/2012 12:00:00 AM

Completion Date : 1/31/2012 12:00:00 AM

Action Taken : An email communication was sent out on January 14, 2012 by Tim Storrs to members of the 2003 Project Team, members of the 2008 SDA PHA team, and current process and designs engineering managers sharing the learnings from this incident investigation. The following is an excerpt from this communication:

" A recent incident in the SDA plant (Incident Investigation LI 14594) involving natural gas flowing backward around the cutter charge pumps P-155/A through the pump minimum flow bypass control valve FV156 resulted in venting natural gas to atmosphere at the cutter(LCO) tank T-397. While this event occurred during a plant shutdown when cutter was being used intermittently for plant cleanup, it could also have occurred during normal operation if the main pump shut down and the spare was not started. Neither the PHA for the 2003 project to install the modified cutter delivery system nor the 2008 plant PHA mentions this potential backflow hazard scenario. When designing a new facility or performing a risk assessment on an existing plant, it is important to remember the potential for backflow from a secondary source if the main pressurization is lost."

In addition to this communication, a new electronic folder has been created to aid PHA facilitators incorporate learnings from this incident and from future incidents in which the PHA did not adequately recognize risks. This folder can be located at O:\Psm\Mod-only\PHAfiles\PHA Learnings.

V&V Date : 2/4/2012 12:00:00 AM

V&V Comments : Review the email with current PHA team and discussed what we will do different in the future to prevent this from happening in all plants.

Person Responsible : CROW, MARK - MXEW

Supervisor/Lead Responsible : WILDMAN, STEPHEN - STDW

Loss / Near Loss (L/NL)

Loss / Near Loss (L/NL)

Stewardship

Loss/Near Loss Quality Review

Quality Review ID : 118046

Status : Closed

Responsible Organization : MFG|RIC|Ops|B&S/U&E ABU|B&S|A Crew(RICREF)

Date Conducted : 11/30/2011 12:00:00 AM

Created Date : 11/29/2011 5:30:13 PM

Steward's Additional Comments :

Steward (Responsibilities) : SMITH, RICHARD - OSMI

Results

Item / Name	Result	Comments
1. Writes thorough description of loss/near loss? *	Yes	Great job of discussing what happened and what the actual consequences were. Potential consequence at 3b sadly appropriate, not too many things having been different would have gotten this actual result.
2. Identifies root cause(s) by explaining why the near loss or loss occurred? *	Yes	The word summary and the E&CF make this painfully clear. Natural gas pressure control plus spill back in auto and open with pumps down is always a bad thing. One nit would be . . . if I'm just looking for a dry source of gas to maintain wash oil pump suction pressure, why does this design use natural gas instead of nitrogen? As much as I appreciated that the TAPRooT E&CF covers the whole 6 days of venting . . one hole for me was that we didn't get to why the tank isn't isolated sooner, given no demand for cutter from the SDA during this window. Also expected that natural gas flow to this system pegs without being noticed to be tagged as a root causal factor.
3. Selects factor(s) from the FSF that matches the root cause? *	Yes	The event has an interesting mix of latent and situational root causal factors. The latent root causal factor is the natural gas pressure control (a clear trap), and the situational root causes link back to shutting down the pumps and not posturing the spillback loop correctly. The situational root causes are thus are an appropriate mix of procedural and training/risk recognition, with some engineering review.
4. Develops solution(s) that matches the factor and addresses root cause? *	Yes	I think the solutions map to the root causes that get identified. I think the Design Review solution (which is a critical one) should have been specific about looking at alternatives to using a potentially explosive gas for V-153A/B pressure control. Could the pumps be updated to deal with lower NPSH? Can we use nitrogen? Etc.
5. Solution is feasible and maintainable? *	Yes	Given that we attack this problem on multiple fronts, I am comfortable that we won't get these exact consequences this same away again.
6. Appropriate reviewers assigned? *	Yes	RBM review for both of the operating areas

Loss / Near Loss (L/NL)

Chevron

Memorandum

To	Jon Mauer – B&S/U&E ABU Manager Johnny Pak – Hydro ABU Manager Dave Feiglstok – HES Manager Steve Wildman – PSM Manager
From	Bharat Chavda – Investigation Team Lead Kenneth Jones – Investigation Team member Marshall Miller – Investigation Team member Ken Wohlgeschaffen - Investigation Team member
Date	1 November, 2011
Re	Completed TapRooT® Investigation – LI # 14594 IMPACT ERM Loss ID # 23624

Event Title: Natural gas routed to T-397

1. Executive Summary:

Natural gas was inadvertently routed to T-397 on October 8, 2011 at 16h37 when flow reversed from the headspace of V-153A/B at the SDA. This resulted in a hazardous condition as natural gas vented via the two breather valves and pressure relief door on the roof of T-397. Attempts to mitigate the risks included cordoning off the tank and introducing a nitrogen purge to the head space. Efforts to locate the source of the natural gas was complicated by startup activity on the TKC and shutdown activity on RLOP and the SDA. The source of the natural gas was identified and isolated on October 13, 08h04. The consequence of this incident was a Title V deviation for exceeding the vapor pressure limit of 0.5 psia for a tank in unregulated service BAAQMD Reg 8-5-117 and Permit Condition 20764. The refinery also received two odor complaints from the community. It was determined that the event met the requirements of a tier 1 loss of containment incident.

2. Incident Description:

a. Background information

The SDA was shutdown on October 7, 2011 to replace the discharge EBV on P-126. The timing of the shutdown was planned to coincide with the major turnaround of the Crude Unit since SDA capacity was planned to be idled at this time. Consistent with procedure SDAN3010, the SDA washout proceeded with LCO in preparation for the maintenance activity. The LCO supply is lined up from T-397 via P-155/A, V-155 and V-153A/B as designed, refer to attached drawing D-340942-1 in Appendix 1. This system was installed around 2003 to improve the quality and reliability of LCO supply to the SDA after incidents of water carryover and interruption of supply. P-155/A is typically in continuous operation. The system is designed with a spillback to

keep P-155/A above minimum flow when LCO is not required to be made up to V-153A/B. Procedure SDAN3010 does not specify the operating posture for P-155/A when the SDA is undergoing a shutdown.

b. Incident Description

During the SDA washout, the LCO system is operated in manual control and batch operation:

- P-155/A is operated intermittently, and only as required to make up the level in V-153A/B. P-155/A is shutdown at 15h53 on October 7 when LCO in V-153A/B reaches the target level and is started up again on 14h41 on October 8, 2011 after a low LCO level. P-155/A was shut down when LCO make up was not going to be required for several hours.
- FC-156 is operated in manual control and closed as from 14h42 on October 8, when P-155/A is started up. This had the potential for being problematic since minimum flow protection was not provided to P-155/A : FC156 is on manual and closed while P-155/A is operating from 14h42 to 16h08 on October 8.
- FC-156 is switched to auto mode at 16h08 on October 8. Shortly thereafter, at 16h12, P-155/A is shutdown. The operation of FC-156 on auto while P-155/A is shutdown proved to be problematic since this introduces the potential for reverse flow. As soon as P-155/A is shutdown, FC-156 opens to 100% open in an effort to increase the flow through P-155/A to the setpoint. The hand valves at P-155/A and FC-156 were not closed at the time that P-155/A was shutdown.
- When P-155/A is shutdown at 14h41 on October 8, LC-1531/2 are switched to auto control. This is problematic since LC-1531/2 opens in a futile attempt to control the level in V-153A/B. As LCO is drawn out of V-153A/B, both LC-1531/2 valves operate 100% open as from 17h53, allowing for reverse flow of natural gas from V-153A/B, via FC-156 as described above, and into T-397.

The combination of 3 events : P-155/A being down, FC-156 being on auto or manually open and either of LC-1531/2 being on auto or manually open resulted in reverse flow of natural gas from the headspace of V-153A/B to V-155, to FC-156 and finally to T-397. The flow of natural gas into T-397 takes place from 16h37 October 8 to 08h04 October 13, 2011. Upon analyzing the operating trends, it appears that the reverse flow of natural gas also occurred previously while P-155/A was down. However, the duration and extent of the flow was usually small because either FC-156 was operating on manual closed or both LC-1531/2 were in manual closed posture.

Gas is to believed to commence entering T-397 at ~16h52 October 8 as indicated by the fluctuating level in T-397. LCO is observed to be dripping from the roof of T-397 on October 10 at ~14h00 by the field operator. A noticeable odor of gas is reported around the B&S area at this time. Troubleshooting efforts are initiated refinery wide that evening to determine the source of the light liquid or gas that had been routed to T-397. The unusual and dynamic posture of plants over the preceding days complicate the troubleshooting effort : RLOP had commenced turnaround activity on October 3, TKC had started up on October 8 and the SDA had shutdown on October 2. Trends and lineups on these plants and the FCC were analyzed in the search for light material that had been routed to T-397.

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3. Incident Consequences

On Monday October 10, personnel confirm the level in T-397 using a reel gauge. While on the tank roof, the personnel note significant venting of gas via the two breather valves and the reel gauge hatch when it was opened. Meanwhile, troubleshooting efforts continue on plants linked to T-397 and personnel conclude that the tank may need to "weather off" the light material once the source is isolated. T-397 is cordoned off for safety reasons.

On Tuesday October 11, the LCO production is sampled and LCO is re-routed to T-979.

On Wednesday October 12 it is noted the venting on T-397 has not subsided. A liquid sample of the tank contents indicates the presence of light hydrocarbon such as natural gas. A sample of the headspace in T-397 confirms the presence of natural gas and an emergency response plan is subsequently prepared. An infrared camera scan of the roof of T-397 indicates that the natural gas is venting from three locations : the two breather valves and the pressure relief door. A nitrogen purge is introduced at the 35' level of T-397 to ensure the tank head space stays oxygen free. A Title V deviation was submitted for exceeding the vapor pressure limit of 0.5 psia for tanks in unregulated service BAAQMD Reg 8-5-117 and Permit Condition 20764. The refinery received two odor complaints from the community on this day. It was determined that the event met the requirements of a tier 1 loss of containment incident.

On Thursday October 13, the source of the natural gas is identified as V-153A/B. FC156 is closed at 08h04 on manual and flow indication FI160 consequently reduces. The evolution of natural gas at T-397 diminishes. A nitrogen purge is continued to T-397 to avoid the ingress of oxygen.

4. Root Causes & Corrective Actions:

See Appendix 4

References & Attachments:

Appendix 1 : Process Flow and Control Diagram : SDA

Appendix 2 : DCS Event Journal

Appendix 3 : T-397 pictures

Appendix 4 : RooT Cause Analysis®

Separate file : Tap RooT® Events & Causal Factors Chart®

7. Additional Information:

Type of Incident *(From II&R Matrix)*:

Incident Level: 2. Potential Incident Level: 3b.

Management Sponsor:

Jon Mauer – Business Unit Manager – B&S/U&E

Investigation Team:

Bharat Chavda – Profit Improvement Coordinator

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Kenneth Jones – Relief Head Operator and Trainer

Marshall Miller – Project Supervisor

Ken Wohlgeschaffen – Senior Process Engineer

Tenets Followed:

Always...

8. Address abnormal conditions

Tenets Compromised:

Always...

1. Operate within design and environmental limits
2. Operate in a safe, secure and controlled condition
4. Follow safe and secure work practices and procedures
7. Comply with all applicable procedures, rules and regulations

OE Processes Compromised:

1. Safe Operations
7. Environmental Stewardship

Report Approved by, Position & Date:

Reviewed and approved by Jon Mauer and Johnny Pak on November 1, 2011.

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Appendix 1 : Process Flow and Control Diagram : SDA

http://ric841ntg3web8/DWGS/3/34094200.DWF

340942-1-0.pdf

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Appendix 2 : DCS Event Journal

Time	Journal	ag/Raw	rm/Para	state/O	Priority/NewVa				
10/7/2011 3:36 PM	Alarm	67MI155	OFFNRM	RTN	LOW	Enabled	MP-155 MTR RUN		STOPPED
10/7/2011 3:45 PM	Alarm	67MI155	OFFNRM	ALM	LOW	Enabled	MP-155 MTR RUN		RUNNING
10/7/2011 3:45 PM	Alarm	67MI155	OFFNRM	RTN	LOW	Enabled	MP-155 MTR RUN		STOPPED
10/7/2011 3:45 PM	Alarm	67MI155	OFFNRM	ACK	LOW	Enabled	MP-155 MTR RUN		67V153
10/7/2011 3:46 PM	Alarm	67MI155	OFFNRM	ALM	LOW	Enabled	MP-155 MTR RUN		RUNNING
10/7/2011 3:48 PM	Alarm	67MI155	OFFNRM	ACK	LOW	Enabled	MP-155 MTR RUN		67V153
10/7/2011 3:53 PM	Alarm	67MI155	OFFNRM	RTN	LOW	Enabled	MP-155 MTR RUN		STOPPED
10/8/2011 2:41 PM	Alarm	67MI155	OFFNRM	ALM	LOW	Enabled	MP-155 MTR RUN		RUNNING
10/8/2011 2:42 PM	Alarm	67MI155	OFFNRM	ACK	LOW	Enabled	MP-155 MTR RUN		67V153
10/8/2011 4:12 PM	Alarm	67MI155	OFFNRM	RTN	LOW	Enabled	MP-155 MTR RUN		STOPPED

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Time	Journal	ag/Raw	rm/Para	tate/O	rity/N			
10/7/2011 3:44 PM	Change	67LC1531	MODE	AUTO	MAN		V153A LEVEL	26
10/7/2011 3:44 PM	Change	67LC1531	OP	0.1877	- 6.9000		V153A LEVEL	26
10/7/2011 3:44 PM	Change	67LC1532	MODE	AUTO	MAN		V153B LEVEL	26
10/7/2011 6:47 PM	Change	67LC1532	OP	- 6.8900	5.0000		V153B LEVEL	26
10/7/2011 6:47 PM	Change	67LC1531	OP	- 6.9000	5.0000		V153A LEVEL	26
10/7/2011 6:49 PM	Change	67LC1531	OP	5.0000	- 6.9000		V153A LEVEL	26
10/7/2011 6:49 PM	Change	67LC1532	OP	5.0000	- 6.9000		V153B LEVEL	26
10/7/2011 10:43 PM	Change	67LC1531	OP	- 6.9000	10.0000		V153A LEVEL	26
10/7/2011 10:43 PM	Change	67LC1532	OP	- 6.9000	10.0000		V153B LEVEL	26
10/7/2011 10:43 PM	Change	67LC1531	OP	10.0000	50.0000		V153A LEVEL	26
10/7/2011 10:43 PM	Change	67LC1532	OP	10.0000	50.0000		V153B LEVEL	26
10/7/2011 10:44 PM	Change	67LC1531	OP	50.0000	- 6.9000		V153A LEVEL	26
10/7/2011 10:44 PM	Change	67LC1532	OP	50.0000	- 6.9000		V153B LEVEL	26
10/8/2011 2:38 PM	Change	67LC1531	OP	- 6.9000	100.0000		V153A LEVEL	26
10/8/2011 2:38 PM	Change	67LC1532	OP	- 6.9000	100.0000		V153B LEVEL	26
10/8/2011 2:41 PM	Change	67LC1531	MODE	MAN	AUTO		V153A LEVEL	26
10/8/2011 2:41 PM	Change	67LC1531	SP	18.8747	70.0000		V153A LEVEL	26
10/8/2011 2:41 PM	Change	67LC1532	MODE	MAN	AUTO		V153B LEVEL	26
10/8/2011 2:41 PM	Change	67LC1532	SP	16.9216	70.0000		V153B LEVEL	26
10/8/2011 3:16 PM	Change	67LC1532	MODE	AUTO	MAN		V153B LEVEL	26
10/8/2011 3:16 PM	Change	67LC1532	OP	106.9000	- 6.9000		V153B LEVEL	26
10/8/2011 3:41 PM	Change	67LC1532	OP	- 6.9000	25.0000		V153B LEVEL	26
10/8/2011 3:43 PM	Change	67LC1532	OP	25.0000	50.0000		V153B LEVEL	26
10/8/2011 3:43 PM	Change	67LC1532	OP	50.0000	100.0000		V153B LEVEL	26
10/8/2011 3:56 PM	Change	67LC1531	MODE	AUTO	MAN		V153A LEVEL	26
10/8/2011 3:56 PM	Change	67LC1531	OP	75.2323	- 6.9000		V153A LEVEL	26
10/8/2011 3:58 PM	Change	67LC1531	MODE	MAN	AUTO		V153A LEVEL	26
10/8/2011 3:58 PM	Change	67LC1531	SP	73.0164	70.0000		V153A LEVEL	26
10/8/2011 4:12 PM	Change	67LC1532	MODE	MAN	AUTO		V153B LEVEL	26
10/8/2011 4:13 PM	Change	67LC1532	SP	69.0842	70.0000		V153B LEVEL	26

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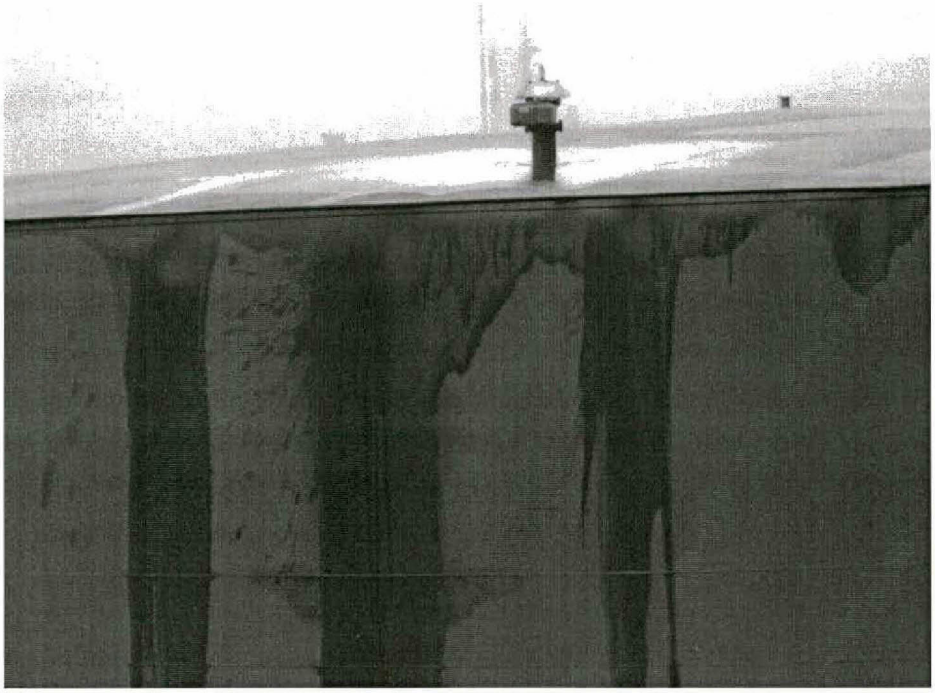
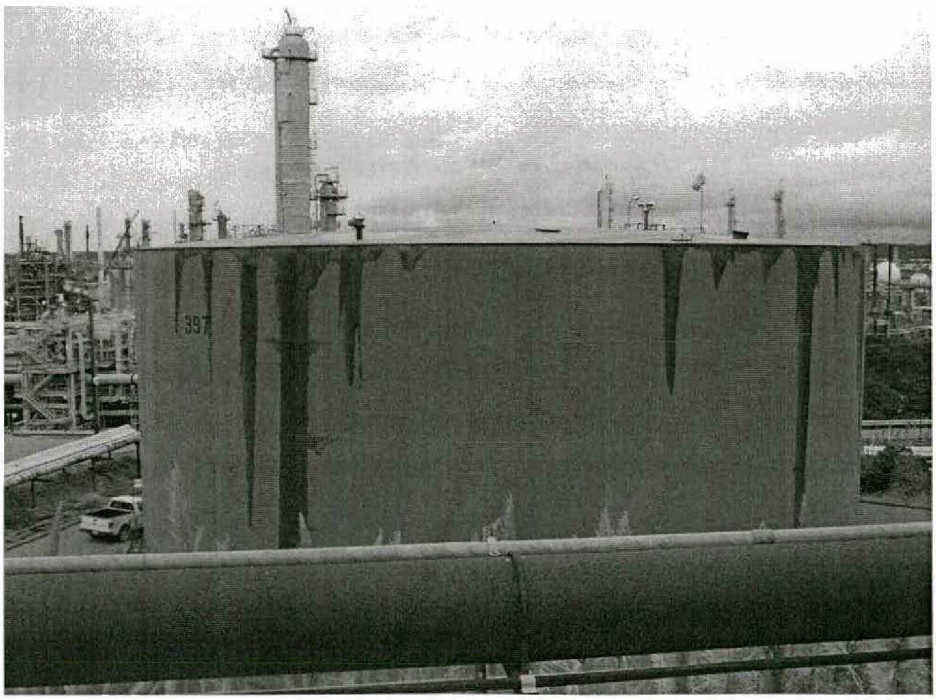
Time	Journal	ag/Raw	rm/Para	tate/O	ority/N			
10/7/2011 6:54 AM	Change	67FC156	OP	49.3632	40.0000		P155/A PUMP RECYCL	26
10/7/2011 7:06 AM	Change	67FC156	OP	40.0000	30.0000		P155/A PUMP RECYCL	26
10/7/2011 7:06 AM	Change	67FC156	OP	30.0000	20.0000		P155/A PUMP RECYCL	26
10/7/2011 7:06 AM	Change	67FC156	OP	20.0000	10.0000		P155/A PUMP RECYCL	26
10/7/2011 7:06 AM	Change	67FC156	OP	10.0000	5.0000		P155/A PUMP RECYCL	26
10/7/2011 9:31 AM	Change	67FC156	OP	5.0000	- 6.9000		P155/A PUMP RECYCL	26
10/7/2011 11:14 AM	Change	67FC156	OP	- 6.9000	5.0000		P155/A PUMP RECYCL	26
10/7/2011 11:15 AM	Change	67FC156	OP	5.0000	10.0000		P155/A PUMP RECYCL	26
10/7/2011 3:13 PM	Change	67FC156	MODE	MAN	AUTO		P155/A PUMP RECYCL	26
10/7/2011 3:13 PM	Change	67FC156	SP	2.7018	15.0000		P155/A PUMP RECYCL	26
10/8/2011 2:39 PM	Change	67FC156	OP	98.1454	25.0000		P155/A PUMP RECYCL	26
10/8/2011 2:40 PM	Change	67FC156	MODE	MAN	AUTO		P155/A PUMP RECYCL	26
10/8/2011 2:40 PM	Change	67FC156	MODE	AUTO	MAN		P155/A PUMP RECYCL	26
10/8/2011 2:42 PM	Change	67FC156	OP	25.0410	10.0000		P155/A PUMP RECYCL	26
10/8/2011 2:42 PM	Change	67FC156	OP	10.0000	0.0000		P155/A PUMP RECYCL	26
10/8/2011 2:43 PM	Change	67FC156	OP	0.0000	- 6.9000		P155/A PUMP RECYCL	26
10/8/2011 4:08 PM	Change	67FC156	MODE	MAN	AUTO		P155/A PUMP RECYCL	26
10/8/2011 4:08 PM	Change	67FC156	SP	18.7979	20.0000		P155/A PUMP RECYCL	26
10/8/2011 4:33 PM	Change	67FC156	MODE	MAN	AUTO		P155/A PUMP RECYCL	26
10/8/2011 4:33 PM	Change	67FC156	SP	0.0000	20.0000		P155/A PUMP RECYCL	26

Appendix 3 : T-397 pictures





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Appendix 4 : RooT Cause Analysis®

Causal Factors are problems (whether conditions or events) that, if eliminated, would have prevented the incident from occurring or would have significantly mitigated its consequences.

Causal Factor #1: P-155/A is shutdown without closing the valves at P-155/A and FC-156.

Condition	Guide	Basic Cause Category	Near Root Cause	Root Cause	C/A	Assigned To	Due By
Human Performance Difficulty	Did failure to agree about the who / what / when / where of performing the job play a role in this incident?	Training	Understanding NI	Practice / repetition NI	1. Review this incident with the crews. Highlight the need to be aware of the potential for reverse flow when decommissioning equipment.	Fredrick Walker	Jan 31, 2012
Human Performance Difficulty	Were policies, admin controls, or procedures not used, missing, or in need of improvement?	Management System	Not Used / Not Followed	No procedure	1. Specify the operating mode of the P-155/A / V-153A/B system during an SDA shutdown in the procedure to avoid uncertainty and assist consistency. Include necessary cautionary notes with regards the potential for reverse flow to the LCO tank.	Kenneth Jones	Jan 31, 2012
Human Performance Difficulty	Did the person need more skill / knowledge to perform the job or to respond to conditions or to understand system response?	Training	Understanding NI	Practice / Repetition NI	1. Discuss the incongruities in the operation of the LCO system in the runup to the incident with the individual(s) concerned : a. Operations of P-155/A with the spillback valve on manual and closed, b. Switching FC-156 to auto control shortly before shutting down P-155/A, c. Switching LC-1532 to auto control as P-155/A is shutdown and operating LC-1531 on auto control during this time.	Jason Hagberg	Dec 31, 2011
Equipment Difficulty	Design	Design Specs	Problem Not Anticipated	Equipment Environment no considered	1. Perform a design review of the LCO supply system to the SDA in the context of the potential for reverse flow and the potentially severe consequences. Determine if any engineering controls are required to mitigate a reverse flow of natural gas such as interlock of the valve with the pump, high flow alarm on the natural gas, etc.	Jason Waldrop	Mar 30, 2012
					2. Share the findings of this investigation with the team that performed the PHA review of the SDA in 2008 so that the learnings from this event are shared and to obtain a commitment from the team to perform a more thorough review in future.	Steve Wildman	Jan 31, 2012

					3. Share the findings of this investigation with the team that performed the HAZOP for the LCO facility in ~2003 so that the learnings from this event are shared and to obtain a commitment from the team to perform a more thorough review in future.	Steve Wildman	Jan 31, 2012

Additional Considerations:

#1 – The signed-off procedure SDAN3010 used during this event could not be located. It was established that the procedure was used, and signed off but not retained as required.

C/A	Assigned To	Due By
Reinforce that signed off procedure needs to be submitted to the STL after use. Any comments or suggestions on the procedure needs to be marked up on this copy so that necessary improvement or clarifications can be made. Gain a commitment from those involved that this expectation will be met.	Fredrick Walker	Jan 31, 2012

#2 – During the investigation it was determined that FC-156 was operated in manual to avoid nuisance alarms.

C/A	Assigned To	Due By
Review the reasons for the nuisance alarms on FC-156 and, as appropriate, resolve so that the spillback control can be operated as designed.	Jason Waldrop	Jan 31, 2012

C/A	Assigned To	Due By
Review with the crews that frequent and nuisance alarms, such as the FC-156 flow alarm, should be brought to the attention of the STL so that the appropriate cause can be investigated and corrective actions taken.	Jason Hagberg	Dec 31, 2011

Tap RooT Appendix 5

Events and Causal Factors Chart

Natural Gas enters T-397 – IMPACT ERM

#23624

~2003 : LCO dewatering project completed; 2008 : PHA completed on the SDA

Intended to supply dry LCO to SDA. Project succeeded in this objective

T-397 LCO supply to SDA made at this time

2008 : PHA completed on the SDA

March 7, 2011

P-126A discharge EBV would not close completely

Faulty EBV identified while attempting to take P126A out for an outboard seal leak

EBV could not be repaired on the run; placed on shutdown worklist

SDA was planned to be idled during October 2011 turnaround

P-126A seal bump started to stop ourboard seal leak

SDA operated without a spare solvent pump since Mar 7, 2011

If P-126B or C were to shutdown, the SDA would go to single module operation

Oct 7, 2011

SDA shutdown

Procedure #SDAN3010 used during SDA shutdown

Procedure does not specify P-155/A posture during SDA cleanup 1

Discharge EBV on P-126A replaced

Failure investigation on EBV in progress; documentation pending

October 8, 14h41

P-155/A LCO pumps started up

V-153A/B LCO levels are low as LCO is used for the SDA cleanup

FC-156 is operated in manual mode

FC-156 was previously switched to manual to avoid frequent flow alarms

Past practice has been to leave P-155/A online to supply LCO as required

October 8, 14h41

FC156 and LC1531/2 placed on auto control

Levels in V-153A/B increase

LC-1531/2 switched to manual control to stroke valves

LC1531 placed on auto control for 70% level at 15h58

FC156 mode is switched from manual to auto at 16h08

LC1532 placed on auto control for 70% level at 16h12

October 8, 16h12

P-155/A is shutdown 1

V-153A/B levels are close to the setpoint

Hand valves on P-155/A or FC156 are not closed 1

October 8, 16h12

FC-156, LC1531 and LC1532 open to 100% on auto control

A path for natural gas reverse flow is created from V-153A/B to T-397

Oct 8, 2011 – 16h37

Natural gas flow FI160 increases as gas flows from V-153A/B to T-397

Flow indication on FI160 exceeds meter range

Natural gas enters T-397

Natural gas vents to atmosphere via the 2 breather valves and explosion hatch on T-397

Flow of natural gas to T-397 occurs from Oct 8 ~16h37 to Oct 13 ~08h04

Level in T-397 swings significantly as gas enters the tank at 16h51

Monday October 10, 2011 14h00

Field Operator reports LCO dripping from T-397 roof

Entrained LCO stains the top and the side of T-397 as it exits the breather valves

Noticeable gas odor detected around B&S emanating from T-397

Troubleshooting efforts launched to identify the source of the "light material" entering T-397

Unusual posture of several plants during turnaround complicates the troubleshooting

See page 2

Normal operating level confirmed in T-397 using reel gauge

Significant venting observed via the breather valves and gauge hatch

Personnel conclude that the tank may need to "weather off"

Area around T-397 is cordoned off, limiting access to the tank

Initial efforts in the Cracking ABU focus on LCO quality supplied

Initial efforts in the NISO ABU focus on light product misrouted from the TKC

TKC introduced feed on October 8, 2011

Initial efforts in the South Isomax ABU focus on pentane and Nitrogen

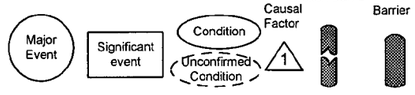
Initial efforts in the RLOP area focus on recovered oil and gas

RLOP commenced turnaround activity on October 3, 2011

T-397 level build up slows from 5,100 BPD to 2,100 BPD at ~midday on 10 October

It is suspected that some light liquid had entered T-397 prior to ~midday

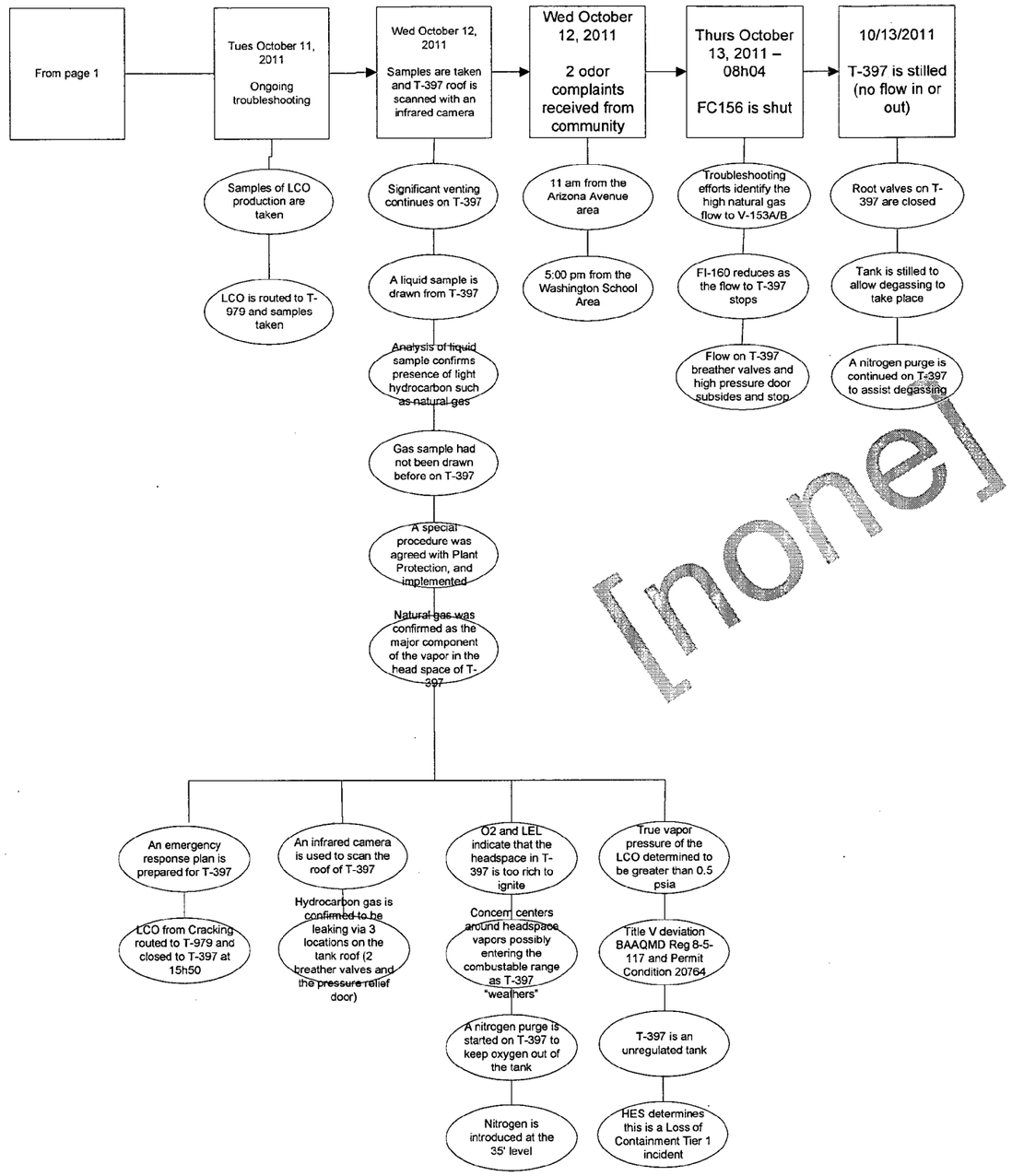
Symbol Key:



Chevron Richmond Refinery

Events and Causal Factors Chart

Natural Gas enters T-397 – IMPACT ERM #23624



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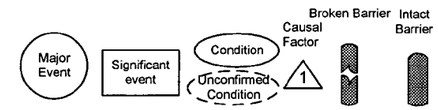

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